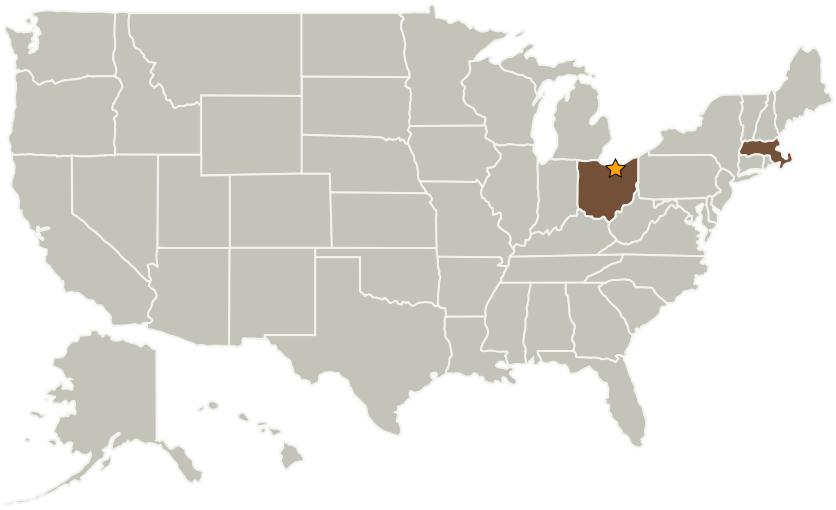
An Ultra-Sensitive, Size Resolved Particle Mass Measurement Device, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

The characterization of aircraft particulate matter (PM) emissions has benefited greatly by the Aerosol Mass Spectrometer (AMS) by providing size resolved compositional information. AMS data have been critical to much of our understanding of aircraft PM emissions, but it has limited utility in probing the smallest (<100 nm) particles in the exhaust. Also, to date the AMS has been able to detect only volatile PM and other instruments have been required to characterize the non-volatile (soot). We propose to improve greatly the capabilities of a novel version of the AMS to cover two important gaps in our understanding of gas turbine engine particle emissions: 1) size resolved composition of particles with diameters less than 50 nm; 2) size resolved mass and chemical composition (e.g., fullerenic composition) of black carbon soot. Specifically in Phase I, we aim to: 1) improve AMS detection of particles smaller than 100 nm by refining an existing computational fluid dynamics (CFD) model and use the CFD model to guide the design of new AMS particle focusing designs, and 2) evaluate for model soot characterization a newly developed instrument which combines a laser ablation system with AMS technology -- an instrument which we have termed the SP2-AMS.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Aerodyne Research, Inc	Supporting Organization	Industry	Billerica, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.4 Space Weather Prediction